

INFORMATION PROCESSING APPARATUS, INFORMATION  
PROCESSING METHOD, AND CONTROL PROGRAM

BACKGROUND OF THE INVENTION

5 Field of the Invention

The present invention relates to an  
information processing apparatus, such as a  
personal computer or a workstation that can  
install a driver for controlling various  
10 peripheral devices, an information processing  
method and a control program.

Related Background Art

Conventionally, for an information processing  
apparatus, such as a personal computer or a  
15 workstation, a specific folder, such as a printer  
folder, is opened and an additional icon is  
double-clicked on that executes a device  
installation function provided by an operating  
system (OS), so that a device (hereinafter each  
20 device type is called an object) that is used in  
common across a network, or that is locally  
connected, is installed by the operating system  
(OS). When an object to be installed is not  
available at a local machine (is not connected  
25 locally), a device that is connected across a  
network is searched for by referring to a  
reference dialogue, so that an object is specified

and an installation instruction therefor is issued.

Generally, the list in a reference dialogue is displayed by sorting printers by name. Further, when a printer device that is locally connected to a PC other than a local machine is set so that it can be used in common, since the object of the common device is hidden under the PC icon, the tree structure must be traced down from the PC icon (hereinafter referred to as a PC object), before the object can be designated and an installation instruction issued therefor.

However, when the above user interface process is employed, the following problems, (1), (2) and (3), are encountered.

- (1) A user must open and close many (+) controls for the PC object until the object, consisting of a desired printer device, is reached.
- (2) Since the object list of the printer devices displayed is prepared by sorting the printer devices in alphabetic order, no consideration is given to the use frequencies thereof, and on a list, the rank assigned to a frequently employed object may be lower than other, less used objects.
- (3) There is no difference in the display of access right levels, and frequently the access and release of the PC object is wasted.

## SUMMARY OF THE INVENTION

To resolve the above shortcomings, it is one objective of the present invention to make available an information processing apparatus that provides a useful user interface, which is employed to detect a specific object in directory information read from a storage device, which controls an object display for the display, in accordance with a tree structure, of the specific object, as a preference, at a relatively upper position on a list, and for which, in order to select the preferred specific object and to correctly display that object at an appropriate relative position, the operations required of a user are simplified; and an information processing method and a storage medium therefor.

To achieve the above objective, according to one aspect of the present invention, an information processing apparatus comprises:

20 a storage device, for storing predetermined objects for predetermined devices based on directory information;

detection means, for detecting a specific object included in the directory information read from the storage device;

display means, for displaying as an entry in a list, in accordance with the structure of a tree,

the specific object detected by the detection means; and

control means, for permitting the display means to employ a number of steps along a  
5 directory path leading from a local object to the specific object, so that the specific object detected by the detection means is displayed on a list in accordance with the structure of a tree.

According to another aspect of the invention,  
10 an information processing apparatus comprises:

a storage device, for storing predetermined objects for predetermined devices based on directory information;

detection means, for detecting a specific  
15 object included in the directory information read from the storage device;

display means, for displaying, as an entry in a list, the specific object detected by the detection means in accordance with the structure  
20 of a tree; and

control means, for permitting the display means to omit a directory path to the specific object and to display the specific object detected by the detection means on a list in accordance  
25 with the structure of a tree.

Other features and advantages of the present invention will become apparent during the

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following description given in conjunction with the accompanying drawings, throughout which like reference characters are used to designate the same parts or similar portions thereof.

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#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a diagram showing an overview of an information processing apparatus according to the present invention;

10 Fig. 2 is a block diagram for explaining the configuration of the information processing apparatus according to the present invention; .

Fig. 3 is a schematic diagram for explaining the processing performed by the information  
15 processing apparatus when installing a printer object in a system;

Fig. 4 is a schematic diagram for explaining the driver installation processing performed by the information processing apparatus according to  
20 the present invention;

Fig. 5 is a schematic diagram for explaining the driver installation processing performed by the information processing apparatus according to the present invention;

25 Fig. 6 is a flowchart showing the data processing performed by the information processing apparatus according to the present invention;

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Fig. 7 is a diagram showing an example program supply medium for the information processing apparatus according to the present invention; and

5 Fig. 8 is a diagram for explaining the memory map for a storage medium on which are stored various data process programs that can be read by the information processing apparatus of the invention.

10 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 1 is a diagram showing an overview of an information processing apparatus according to the present invention.

15 In Fig. 1, an information processing apparatus 3000, such as a personal computer, is an appropriate apparatus that can perform a rapid, continuous determination process. The information processing apparatus 3000 includes a keyboard 9  
20 for receiving user input and a CRT 10 for displaying information for the user.

The information processing apparatus 3000 comprises: an external memory 11, for driving a removable storage medium, such as a magnetic disk  
25 (a floppy disk (FD) or a hard disk (HD)), a magneto-optical disk (MO), an optical disk (a CD-ROM, a CD-R or a CD-RW) or a digital video disk (a

DVD-ROM or a DVD-RAM).

Fig. 2 is a block diagram for explaining the configuration of the information processing apparatus of the invention, and the same reference numerals as are used in Fig. 1 are used to denote corresponding components.

In Fig. 2, by using a RAM 2 as a work memory, a CPU 1, which is a microprocessor, processes a document wherein graphics, images, characters and tables (including spreadsheets) coexist, based on a program and data that are stored on a storage medium in the external memory 11, and totally controls a device, which will be described later, by using a system device 4.

A program executed by the CPU 1, such as the one shown in a flowchart that will be described later, is stored in a ROM area 302 in a ROM 3 or on a storage medium in the external memory 11.

Font data is stored in a ROM area 301 in the ROM 3 to generate a character pattern, with which, during the document process, characters and symbols in character data are created or edited, that is displayed on a CRT display (CRT) 10.

Various data used for the document process and the display process, such as the directory information in the ROM 3 and in an application table, are stored in a ROM area 303 in the ROM 3.

A keyboard controller (KBC) 5 controls entries made using the keyboard (KB) 9 or a pointing device (not shown), such as a mouse; and a CRT controller (CRTC) 6 controls the display on the CRT 10.

A disk controller (DKC) 7 controls access to the HD and the external memory 11, and reads and writes various programs and various data, such as font data, a user file and an edited file, related to the storage medium. A printer controller (PRTC) 8 is connected to a printer 22, via a predetermined bidirectional interface 21, and communicates with the printer 22. The CPU 1 expands (rasterizes) the outline font used for the display information area allocated for the RAM 2, or a special video memory (VRAM), and enables a WYSIWG display on the CRT 10. Based on commands entered using the mouse cursor displayed on the CRT 10, the CPU 1 opens various registered windows and performs various data processes.

Before the installation process using the thus arranged information processing apparatus is explained in detail, a description will be given of the general installation process that is performed.

Fig. 3 is a schematic diagram showing the process performed by the information processing



apparatus when a printer object is installed in the system.

In Fig. 3, a printer object 30 is used to display a printer device that is locally connected or is used in common across a network. Generally, the search function is provided by the OS, but in the Windows OS, a PC on a network and a network connected printer are searched for by clicking on a network icon, and a printer that is found is displayed as a printer object. When the printer object 30 is to be installed on a local PC system, a specific folder 31 provided by the OS (in this embodiment, a printer folder to install a printer device) is opened, and an additional icon 31a for a printer is double-clicked on.

While the printer folder to install a printer device in use is provided by the OS, for the connection to a network of another scanner or digital camera, a specific folder is not prepared by the OS and a function must be added as a utility program.

When the printer object 31a is not present in the local machine, a device connected via a network is searched for by referring to a printer reference dialogue 34, so that an object can be designated and an installation instruction issued. The list in the printer reference dialogue 34 is

prepared for display by using host names to sort the printers.

When a printer device that is connected locally to a specific host PC is set up for use in common, the printer object is hidden under the host PC object and is not specifically displayed as an icon. Thus, the (+) control is pointed at using a pointing device and is depressed (clicked on), so that the printer object can be observed by opening and displaying the list (see the printer reference dialogue 34 in Fig. 3).

Therefore, a user must expand the list in order to select a desired printer object to be installed. And when the printer object is thus selected, the user must either double-click on the selected printer object, or must drag the selected printer to and drop it on the printer folder 31, so as to begin a process 35 for installing the selected printer object. As a result of this process, a printer driver, which is a device control program (and includes a print data generation program and a dynamic link library used to notify an OS of the presence of a translatable drawing function) is installed in the local PC, so that the printer device that corresponds to the selected printer object can be used by the local PC. When the process 35 for installing the

printer object, i.e., the printer driver  
installation process, has been completed, a  
printer object 39a is added to the printer folder  
31 of the local PC system and is displayed (see 39  
5 in Fig. 3).

Before the installation can be completed, a  
process 36 for setting an output port is required,  
and when a device driver (also a dynamic link  
library) required for the connection of an object  
10 is not found, a driver storage location 38 must be  
designated. In this embodiment, the driver  
installation process is performed as is shown in  
Figs. 4 and 5.

Before the installation process can be  
15 completed, the process 36, for setting the output  
port, must be performed, or if a device driver  
(also a dynamic link library) required for the  
connection of an object is not found, the driver  
storage location 38 must be designated. On the  
20 other hand, in this embodiment, the driver  
installation process shown in Figs. 4 and 5 is  
performed.

Figs. 4 and 5 are schematic diagrams for  
explaining the driver installation processing  
25 performed by the information processing apparatus  
according to the present invention. In Fig. 4,  
the state corresponds to the processing state at

the time the driver is installed, and in Fig. 5, the state corresponds to the display of the list of search results.

The feature differing from the driver installation process state in Fig. 3 is that the method used for generating the displayed contents of the printer reference list differs from the display method used for the general list shown in Fig. 3.

Specifically, in the list display example in Fig. 3, host names are used to sort the printers on the list prepared for the reference dialogue 34. When a printer is set for use in common by a specific host, it is hidden under the host and is not directly displayed as an icon. Thus, to view the hidden printer, the (+) control is pointed to by the cursor, which is manipulated by a pointing device (not shown), and is depressed, and the list is opened and displayed. On the other hand, in Figs. 4 and 5, according to the list display process of this embodiment, the printer reference lists in the printer search dialogues 44 and 54 are basically displayed as printer icons, and the printers are presented in order, beginning with the printer nearest the machine that is currently being operated. That is, when the utility program displays, on the CRT 10 (the display means), a

tree structured list of printer objects detected  
by the detection means (the utility program that  
permits the CPU 1 in Fig. 1 to access the external  
memory 11 and detect printer objects), the utility  
5 program controls the display process so as to  
display, in accordance with the number of steps  
along a direct path to them, the printer objects  
that are detected by the apparatus that is  
currently being operated, or a local machine,  
10 which is the printer connected to the pertinent  
apparatus. For example, printer objects arranged  
as a list, in the ascending order of the number of  
directories that must be searched or the objects  
that must be tracked in order to reach a target  
15 printer object from the local apparatus, are  
displayed, or the local printer, which is a local  
object, is displayed.

The PC has been described as a preferred  
example information processing apparatus that  
20 comprises: a storage device (corresponding to the  
external memory 11 in Fig. 2), for storing  
predetermined objects for predetermined devices  
based on the directory information; detection  
means (the CPU 1 in Fig. 2 accesses the external  
25 memory 11 to perform the detection process), for  
detecting a specific object from the directory  
information read from the storage device; display

means (corresponding to the CRT 10 in Fig. 2), for  
displaying, in a tree structured list, the  
specific objects detected by the detection means;  
and control means (corresponding to the utility  
5 program that permits the CPU 1 in Fig. 2 to  
control the display of objects on the CRT 10), for  
controlling the display, on the display means, of  
the tree structured list of the objects detected  
along the directory path by the detection means,  
10 beginning with the object nearest the local object.

That is, according to the embodiment, the  
path up to the printer object is hidden by the (+)  
control, and in order to find a printer, the  
manipulation of the pointing device (not shown)  
15 and the use of the cursor to designate the target  
printer are not required. In other words, the  
utility program (control means), when displaying  
the printer object, performs the display process  
in such a way that the intermediate directory path  
20 leading to the object that is displayed is  
eliminated.

Therefore, since the list display process in  
Figs. 4 and 5 does not require that an operation  
to depress the (+) control be performed until the  
25 required printer object is reached in the list in  
Fig. 3, and since no scrolling operation is  
required to search for the host name, the

processing can be simplified.

According to the present invention, since a printer search icon 61a is prepared for the printer folder, a function can be provided that permits a user who desires to install a specific printer object to search for the desired printer device.

Specifically, in Fig. 4, when a printer object 40 is to be installed in the system, a specific folder (a printer folder in this embodiment) 41 is opened, and while a pointing device (not shown) is used to point to a search icon, the left button (not shown), for example, of the pointing device is used to double-click on the icon.

Then, after the search process for the printer device has been initiated, the attributes of the printer devices that are found are obtained. And thereafter, when the search process has been completed, a dialogue for displaying a list of the search results is generated and is displayed as a printer search dialogue 44 on the CRT 10, the display means.

Basically, printer icons are employed for the display of the list presented using the printer search dialogue 44, and the printers are displayed in order, beginning with the printer nearest the

machine that is currently being operated.

The path up to the printer object is hidden by the (+) control, and the depression and designation process using the pointing device is not required to find the desired printer. At this time, assuming that a modeless relationship is established between the search results dialogue and the printer folder, the installation can also be started while an instruction 45 for dropping the printer icon displayed on the CRT 10 into a folder 48 is regarded as the double-clicking process performed for the additional icon of the printer.

When the installation is completed in this manner, the printer object is added to a printer folder 49. Since the directory structure information is present in the installation process in Fig. 4, so long as printer access rights are obtained, the associated port setting process can be automatically performed.

During the process performed for displaying the search list in accordance with the embodiment, as is shown in Fig. 5, a search results display list 54 is prepared. In this case, methods 55 to 58, for processing the directory information obtained from the system, are employed.

In Fig. 5, when the directory structure in



the portion enclosed by a circle for the method 55  
is employed to process the directory information  
obtained from the system, printers on the search  
results display list are arranged in the order (1),  
5 (2) and (3) if the user information processing  
apparatus (machine) is regarded as machine A in  
Fig. 5.

The printers are displayed beginning with the  
printer at the shortest distance (at the nearest  
10 location) from the machine A along the directory  
node. Since the nearest printer, which it is  
comparatively probable will be installed in the  
machine A, is located at the head of the list,  
required operations, such as scrolling, can be  
15 reduced.

Further, as is shown in Fig. 5, the node in a  
portion 56 enclosed by a circle is removed when it  
is not directly related to the user's operation.  
Only when the user must refer to the direct path  
20 must he or she designate the (+) control with a  
cursor by manipulating a pointing device, and  
click on and open the (+) control.

A directory in a portion 57, enclosed by a  
circle, that does not include printer objects is  
25 not a target to be displayed.

When, as is shown in a portion 58, enclosed  
by a circle, the printer object B can not be

directly referred to by the user of the machine A due to the access right relationship, the object C that has no higher access right problem is added to the list.

5           When the forms of the displayed icons differ in accordance with the access rights, on a list, a user can distinguish between a printer that can be accessed comparatively freely and one for which access is limited for security reasons.

10           Conventionally it frequently happens that after the (+) control has been designated by a cursor manipulated by the pointing device (not shown), or after the (+) control has been clicked on, the process for the display of the access  
15 rights message is canceled. In this embodiment, the probability that the above user operation will fail can be considerably reduced.

Fig. 6 is a flowchart for the data processing performed by the information processing apparatus  
20 according to the invention. This processing is the detailed processing performed for the display of the device list at the device installation time in Figs. 4 and 5. S10 to S12, S20 to S22, S30 to S36 and S40 to S46 designate the individual steps.

25           First, in the standby state ST1 an action is entered from a user (S10), and the search icon 41a in Fig. 4 is selected by manipulating the pointing

device (not shown) (S11). Then, the target object  
of the startup folder is stored in a predetermined  
area of the RAM 2 (S12), and program control moves  
to the process for the search results display list  
5 (S20).

First, directory information is requested  
from the system (OS) (S21), and the order for the  
insertion of items in the list is set (S22). Then,  
in accordance with the order, the loop (steps S30  
10 and S31) is entered to search the directory node  
for a target object (S30).

In the loop, the contents to be inserted in  
the list are arranged (S32). When the same object  
type as a startup folder that is stored at step  
15 S12 is found (S33), the CPU 1 determines whether  
this object is at an access right level that can  
not be referred to (S34). When the decision is  
Yes, a higher object that can be directly referred  
to is determined to be the one that will be used  
20 for the display contents (S35). However, when the  
object that is found during the search can be  
referred to directly, this object is regarded as  
the one to be used for the display contents. Then,  
information for the thus determined displayed  
25 object is obtained (S36) and is added to the list  
(S40).

At this time, when the display of an icon has

been set (S41), the icon representing the  
pertinent object is inserted in the list (S42).  
Subsequently, after the name of the object for the  
display has been set (S43), it is inserted into  
5 the list (S44). And when the display of a  
location has been set (S45), a node is inserted by  
eliminating the intermediate path (S46).

This processing is repeated until it is  
ascertained that the node object search has been  
10 completed (S31).

This embodiment of the invention can also be  
applied for a change in the location at which  
directory information is obtained, a change in a  
data merging method used to generate a tree list  
15 using directory information, the removal of a user  
action and a location change, and a change in the  
order in which process units are arranged.

This embodiment, instead of being applied for  
the processing of a single object, such as a  
20 printer, can be applied for the processing of  
multiple objects, such as a printer and a  
facsimile machine for which the functions differ  
(attributes).

Fig. 7 is a diagram showing the process for  
25 supplying a program to the information processing  
apparatus of the present invention. The same  
reference numerals as are used in Fig. 1 are used

to denote corresponding components.

In Fig. 7, when a floppy disk FD, a storage medium, is inserted into a host computer, the information processing apparatus 3000, a program  
5 (program code corresponding to the steps in Fig. 6) is read from the floppy disk FD and loaded into the information processing apparatus 3000, and is written in the external memory 11.

While referring to a memory map in Fig. 8, an  
10 explanation will be given for the structure of a data processing program that can be read by the information processing apparatus 3000 of the invention.

Fig. 8 is a diagram for explaining the memory  
15 map for a storage medium on which are stored various data processing programs that can be read by the information processing apparatus 3000 of the invention.

Although not specifically shown, information,  
20 such as version information and creator information, for managing the programs on the storage medium is also stored thereon, as is information that is relevant to the OS on the program reading side, such as the icons displayed  
25 for the separate programs.

In addition, applicable data for the various programs are also managed in the directory. And

furthermore, programs may also be stored for installing various programs in a computer and for decompressing compressed programs that are to be installed.

5           In this embodiment, the function in Fig. 6 may be performed by a host computer using the program that is externally installed. The present invention can also be applied in a case wherein an information group, including a program, to be  
10 loaded in an output device is supplied by using a storage medium, such as a CD-ROM or a flash memory, or is supplied, via a network, by an external storage medium.

As is described above, the objective of the  
15 invention can also be achieved by supplying to a system, or an apparatus (or a CPU or an MPU), a storage medium on which is recorded software program code that implements the functions of the embodiment, and by permitting the system or the  
20 apparatus to read and execute the recorded program code.

In this case, the program code read from the storage medium provides the new functions of the invention, and the storage medium on which the  
25 program code is recorded constitutes the present invention.

The storage medium used for supplying the

program code can be, for example, a floppy disk, a hard disk, an optical disk, a magneto-optical disk, a CD-ROM, a CD-R, a magnetic tape, a nonvolatile memory card, a ROM, or an EEPROM.

5           In addition, with the present invention it is not only possible for the functions of the preceding embodiment to be provided through the execution of program code by a computer, but also, the program code can interact with an OS running  
10           on the computer, or with another software application, to provide the functions described in the above embodiment.

          Furthermore, with the present invention, program code, read from a storage medium, can be  
15           written in a memory that is mounted on a function expansion board inserted into a computer, or in a function expansion unit connected to the computer, and in consonance with instructions in the program code, a CPU mounted on the function expansion  
20           board, or in the function expansion unit, can perform part or all of the actual processing required to implement the functions of the above described embodiment.

          In Fig. 8, the storage location of an  
25           application program 998 is recorded in an area 999 for storing directory information. Further, a storage area 997 for the control program shown in

Fig. 6, and a storage area 996 for configuration information used for the processing are also defined.

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The operator of the host computer 3000 refers  
5 to the contents of the floppy disk FD and employs the KB 9 to designate, for example, the name of an application to be installed, and by referring to the table 998 the host computer 3000 can load the designated application. When, for example, the  
10 operating environment XXX is designated, the corresponding application and configuration information stored in the areas 997 and 996 are loaded into the host computer 3000.

According to the embodiment, the operations  
15 that must be performed before an object is reached by tracking the tree list can be considerably reduced. Further, since an object it appears a user frequently employs can be positioned at the top of the list, and since the display of objects  
20 varies in accordance with user access right levels, a user interface can be provided that can be easily manipulated.

The present invention may be applied for a system constituted by multiple apparatuses (e.g.,  
25 a host computer, an interface, a reader and a printer), or for a single apparatus (e.g., a copier or a facsimile machine).



As is described above, according to the invention, when a specific object is detected in the directory information that is read from a storage device, the object display operation is  
5 controlled so as to display a specified object at a higher location on a tree list. Since the operation required to display a specific object desired by a user can be considerably simplified, and since the specific device can be displayed at  
10 an optimal location for the user, a useful interface can be provided.